WHAT IS CLAIMED IS:

1. For use with a multi-stage switch having
   - a plurality of central modules, each having outgoing links, and
   - a plurality of input modules, each including
     - a first number of input ports, each of the input ports having a second number of virtual output queues, and
     - outgoing links coupled with each of the plurality of central modules, and
   - a third number of sub-schedulers, each of the third number of sub-schedulers being able to arbitrate matching an input port with an outgoing link of one of the plurality of central modules via an outgoing link of the input module including the input port,

a method for scheduling the dispatch of cells or packets stored in the virtual output queues, the method comprising:

a) for each of the virtual output queues, maintaining a first indicator for indicating whether the virtual output queue is storing a cell awaiting dispatch arbitration; and

b) for each of the sub-schedulers, performing a matching operation, if it has been reserved, to match a cell buffered at a virtual output queue with an outgoing link of one of the plurality of central modules via an outgoing link of the input module, wherein the matching operation includes:

i) for an input module, matching a non-empty virtual output queue with an outgoing link of the input module, and

ii) matching the outgoing link of the input module with an outgoing link of the associated central module,

wherein each of the sub-schedulers requires more than one cell time slot to generate a match from its matching operation, and

wherein the sub-schedulers can collectively generate a match result in each cell time slot.

2. The method of claim 1 wherein the act of matching a non-empty virtual output queue with an outgoing link of the input module includes

A) broadcasting a request for the non-empty virtual output queue to an arbiter of the sub-scheduler for each of the outgoing links of the input module;

B) selecting, with the arbiter, of the sub-scheduler, of each of the outgoing links of the input module, a non-empty virtual output queue that broadcast a request;

C) sending a grant to an arbiter, of the sub-scheduler, for the selected non-empty virtual output queue; and

D) selecting, with the arbiter, of the sub-scheduler, of the selected non-empty virtual output queue, an outgoing link of the input module from among the one or more outgoing links that sent a grant.

3. The method of claim 2 wherein the act of selecting, with the arbiter, of the sub-scheduler, of each of the outgoing links of the input module, a non-empty virtual

output queue that broadcast a request, is done in accordance with a round robin discipline.

4. The method of claim 3 wherein the round robin discipline moves through groups of virtual output queues, before moving through virtual output queues within each group.

5. The method of claim 2 wherein the acts of

A) broadcasting a request for the non-empty virtual output queue to an arbiter of the sub-scheduler for each of the outgoing links of the input module;

B) selecting, with the arbiter of the sub-scheduler of each of the outgoing links of the input module, a non-empty virtual output queue that broadcast a request;

C) sending a grant to an arbiter of the sub-scheduler for the selected non-empty virtual output queue; and

D) selecting, with the arbiter of the sub-scheduler of the selected non-empty virtual output queue, an outgoing link from among the one or more outgoing links that sent a grant,

are performed at least twice within the third number of cell time slots.

6. The method of claim 1 wherein each of the sub-schedulers require no more than the third number of cell time slots to generate a match result from its matching operation.

7. The method of claim 1 further comprising:

c) if a cell buffered at a virtual output queue has been successfully matched with its corresponding output port, informing the virtual output queue.

8. The method of claim 7 further comprising:

d) for each of the virtual output queues, if the virtual output queue has been informed that it has been successfully matched with its corresponding output port, then dispatching its head of line cell.

9. The method of claim 1 wherein the first indicator, for each of the virtual output queues, for indicating whether the virtual output queue is storing a cell awaiting dispatch, is a count, and

wherein the count is incremented upon learning that a new cell has arrived at the virtual output queue.

10. The method of claim 9 wherein the count is decremented when an available sub-scheduler is reserved for considering a head of line cell at a corresponding virtual output queue.

11. The method of claim 1 further comprising:

c) for each of the sub-schedulers, maintaining a second indicator for each of the virtual output queues, for indicating whether the sub-scheduler is available or reserved,

wherein the second indicator, for each of the sub-schedulers, is set to indicate that the associated sub-scheduler is reserved if the first indicator indicates

that a corresponding virtual output queue is storing a cell awaiting dispatch arbitration.

12. The method of claim 1 further comprising:

c) for each of the sub-schedulers, maintaining a second indicator for each of the virtual output queues, for indicating whether the sub-scheduler is available or reserved,

wherein the second indicator, for each of the sub-schedulers, is set to indicate that the associated sub-scheduler is available if the associated sub-scheduler matches a cell buffered at a virtual output queue with its corresponding output port.

13. The method of claim 1 further comprising:

c) for each of the sub-schedulers, maintaining a second indicator for each of the virtual output queues, for indicating whether the sub-scheduler is available or reserved,

wherein the second indicator is set to indicate that a p^{th} sub-scheduler is reserved if the first indicator indicates that a corresponding virtual output queue is storing a cell awaiting dispatch arbitration,

wherein p is set to the current cell time slot modulo the third number.

14. For use with a multi-stage switch including

- a plurality of central modules, each including outgoing links towards output modules, the output modules collectively including a first number of output ports,

- a plurality of input modules, each including virtual output queues and outgoing links coupled with each of the plurality of central modules, the input modules collectively including a second number of input ports,

a dispatch scheduler comprising:

a) a third number of sub-schedulers; and

b) a first indicator, associated with each of the virtual output queues, for indicating whether the virtual output queue is storing a cell awaiting dispatch arbitration,

wherein each of the sub-schedulers is adapted to perform a matching operation, if it has been reserved, to match a cell buffered at a virtual output queue with its corresponding output port, and includes:

i) for an input module, means for matching a non-empty virtual output queue with an outgoing link of the input module, and

ii) means for matching the outgoing link of the input module with an outgoing link of the associated central module,

wherein each of the sub-schedulers requires more than one cell time slot to generate a match from its matching operation, and

wherein the sub-schedulers can collectively generate a match result in each cell time slot.

15. The dispatch scheduler of claim 14 wherein the means for matching a non-empty virtual output queue with an outgoing link of the input module include

A) means for broadcasting a request for the non-empty virtual output queue to an arbiter

for each of the outgoing links of the input module;

B) for each of the outgoing links of the input module, an arbiter for selecting a non-empty virtual output queue that broadcast a request;

C) means for sending a grant to an arbiter for the selected non-empty virtual output queue; and

D) for the selected non-empty virtual output queue, an arbiter for selecting an outgoing link of the input module from among the one or more outgoing links of the input module that sent a grant.

16. The dispatch scheduler of claim 14 wherein each of the sub-schedulers require no more than the third number of cell time slots to generate a match result from its matching operation.

17. The dispatch scheduler of claim 14 wherein if a cell buffered at a virtual output queue has been successfully matched with its corresponding output port, the virtual output queue is so informed.

18. The dispatch scheduler of claim 14 wherein if a cell buffered at a virtual output queue has been successfully matched with its corresponding output port, its head of line cell is dispatched.

19. The dispatch scheduler of claim 14 wherein the first indicator, for each of the virtual output queues, for

indicating whether the virtual output queue is storing a cell awaiting dispatch arbitration, is a count, and

wherein the count is incremented upon learning that a new cell has arrived at the virtual output queue.

20. The dispatch scheduler of claim 19 wherein the count is decremented when an available sub-scheduler is reserved for considering a head of line cell at a corresponding virtual output queue.

21. The dispatch scheduler of claim 14 further comprising:

c) a second indicator for each of the virtual output queues and for each of the sub-schedulers, indicating whether the sub-scheduler is available or reserved,

wherein the second indicator, for each of the sub-schedulers, is set to indicate that the associated sub-scheduler is reserved if the first indicator indicates that a corresponding virtual output queue is storing a cell awaiting dispatch arbitration.

22. The dispatch scheduler of claim 14 further comprising:

c) a second indicator for each of the virtual output queues and for each of the sub-schedulers, indicating whether the sub-scheduler is available or reserved,

wherein the second indicator, for each of the sub-schedulers, is set to indicate that the associated sub-scheduler is available if the associated sub-scheduler matches a cell buffered at a virtual output queue with its corresponding output port.

23. The dispatch scheduler of claim 14 further comprising:

c) a second indicator for each of the virtual output queues and for each of the sub-schedulers, indicating whether the sub-scheduler is available or reserved,

wherein the second indicator is set to indicate that a p^{th} sub-scheduler is reserved if the first indicator indicates that a corresponding virtual output queue is storing a cell awaiting dispatch, and

wherein p is set to the current cell time slot modulo the third number.

24. The dispatch scheduler of claim 14 wherein the arbiter of each of the outgoing links of the input module for selecting a non-empty virtual output queue that broadcast a request, operates in accordance with a round robin discipline.

25. The dispatch scheduler of claim 24 wherein the round robin discipline moves through groups of virtual output queues, before moving through virtual output queues within each group.

26. The dispatch scheduler of claim 14 wherein the means for matching a non-empty virtual output queue with an outgoing link of the input module performs multiple iterations of matching a non-empty virtual output queue with an outgoing link of the input module within the third number of cell time slots.